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(54) HYDRAULIC EXCAVATOR

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(57) Claim

1. A quick-release hydraulic hitch for attachment to the arm of a hydraulic excavator having a dipper and a tipping link, the hitch being adapted to pick up and retain an implement provided with a pair of parallel laterally extending spaced pins; which hitch comprises

a pair of laterally spaced interconnected upper flanges, each flange having two pin-holes for attaching the hitch to the dipper and tipping links respectively;

a pair of laterally spaced interconnected lower flanges of a spacing less than the spacing of the upper flanges and connected thereto;

the lower flanges being provided at one end with stationary hook means for embracing one pin on the implement; and

hydraulic means connected to sliding hook means at the other end of the lower flanges for embracing the other pin on the implement, so as to attach the implement to the excavator.

The present invention relates to a quick release hydraulic hitch for a hydraulic excavator, which enables implements to be changed automatically by the driver of the excavator without the driver having to leave his control cab.

In particular, the present hitch fits between the arm of a conventional excavator and the conventional implement to be attached thereto, and does not require any modification of the excavator or the implement.

A conventional hydraulic excavator is provided with an articulated arm, and at the end of the arm is a dipper and a pair of tipping links, which may be moved relative to one another so as to manoeuvre a bucket or other implement attached to the end of the arm. Generally, the free end of the dipper and the free ends of the tipping links are provided with pin holes. The implement is also provided with pairs of pin holes and the implement is attached to the arm by passing pins through the holes in the implement, and through the dipper and tipping link respectively.

In the present specification, the term "hydraulic excavator" will be understood to have a wide meaning covering all hydraulic machines having an implement mounted at the end of an arm, and therefore includes not only hydraulic excavators as such but also backhoes.

A wide variety of implements may be used with the hydraulic excavator, for example the implement might be a bucket, auger, drill, tamper, a ripping tooth, a hydraulic drill, a grader blade, or any of the other commercially

available implements. Each implement will be provided with pin holes to enable it to be attached t the dipper and to the tipping links. The implem nts are generally very heavy and difficult to manoeuvre manually. Therefore, the changing over of implements is often a difficult and tim consuming task. Generally, the operator of the excavator requires an assistant who inserts the attachment pins when the excavator arm has been manoeuvred into the correct position.

There have been a number of proposals to provide hitch s which may facilitate the changing of implements. One such hitch is provided with a hook which hooks over a bar provided on the implement. The hitch is then pivoted to enable a locking pin to be passed between the hitch and the implement. However, this system is not totally automatic since it requires manual insertion of the locking pin.

In another proposal, the locking pin arrangement is replaced by a hydraulic ram provided on the hitch which locks the implement in place.

However, these proposals require implements which have been specially modified for operation with the hitch. Thus, an operator wishing to use these hitches, would have to purchase a complete new set of implements.

It is an object of the present invention to provide a hitch which can be interposed between the arm of a conventional hydraulic excavator and its associated conventional implement, without requiring any permanent

modificati n f the implement.

Th present invention provid s a quick-r lease hydraulic hitch for attachment to th arm f a hydraulic xcavator having a dipper and a tipping link, the hitch being adapted to pick up and retain an implement provided with a pair of parallel laterally extending spaced pins; which hitch comprises

a pair of laterally spaced interconnected upper flanges, each flange having two pin-holes for attaching the hitch to the dipper and tipping links respectively;

a pair of laterally spaced interconnected lower flanges of a spacing less than the spacing of the upper flanges and connected thereto;

the lower flanges being provided at one end with stationary hook means for embracing one pin on the implement; and

hydraulic means connected to sliding hook means at the other end of the lower flanges for embracing the other pin on the implement, so as to attach the implement to th excavator.

Each implement is conventionally provided with two laterally spaced hanger arms, each provided with two holes. Normally, the hanger arms are disposed on either side of the dipper and the tipping links. For operation with the hitch of the present invention, two pins ar passed through the two pairs of holes in the implement. These pins allow the implement to be picked up using the hydraulic hitch. Thus, all that is required when using the hydraulic hitch with conventional implements is to provide each implement with a pair of conventional pins to enable it to be picked up by the hitch.

The use of hydraulic means enables the hitch to be controlled from the driver's cab and allows implements to be changed by the driver alone with ut leaving his cab.

Usually, the hydraulic means will act directly on the movable means. H wever, in an alternative arrang m nt the

stati nary and movable means may be interconnected by an elbow joint which is straightened or bent under control of the hydraulic m ans.

The upper flanges are spaced further apart than the lower flanges, so that the upper flanges can fit on either side of the dipper and of the tipping links (the position normally taken by the implement). The lower flanges are closer together than the upper flanges, to allow them to be disposed between hanger arms provided on the implement.

The stationary hook means will generally comprise a U-shaped cut out in an end portion of each lower flange.

Preferably, the stationary hook means will be arranged to point forwardly from the forward end of the hitch, whilst the movable hook means faces backwardly. It is particularly important when the implement is a buck t, to place the stationary hook means at the forward end of the hitch, i.e. the way that the open end of the bucket faces. Thus, the digging force exerted on the bucket will be carried almost entirely by the stationary hook means, with the movable hook means acting principally to retain the bucket on the excavator arm. If the arrangement were reversed, all the digging force would be exerted on the hydraulic system operating the movable hook means, which is undesirable.

In one prefecred embodiment, excess fluid bled from other cylinders of the excavator (for example, the cylinder controlling the tipping link) when the pressure in the hydraulic system exceeds a predetermined maximum (for example, when an obstruction is hit by the bucket)

is arranged to b fed into the hydraulic cylinder of the sliding h ok means so as to boost the hydraulic pressure in the hydraulic hook means and to ensure that the bucket is not t rn from the end of the arm. Normally, when an obstruction is encountered, excess pressure build up in the hydraulic system is prevented by bleeding fluid back to a reservoir. In the present instance, it is important that pressure is not allowed to fall in the hydraulic cylinder controlling the hook means, since otherwise the implement might become detached · with inconvenient and possibly dangerous consequences.

An embodiment of the present invention wil now be described by way of example only with reference to the accompanying drawings, wherein:

Figure 1 is a perspective view of a hydraulic excavator provided with a hitch according to the present invention;

Figure 2 is an enlarged view of the end of the arm showing the hitch;

Figure 3 is a cross-sectional view along line III-III of Figure 5 showing the hitch;

Figure 4 is a side elevation of the hitch; and

Figure 5 is a plan view of the hitch from above.

Figure 7 is a side elevation of the end of an excavator arm equipped with a hitch according to a third embodiment.

Figure 8 is a scrap view of an alternative form of movable hook means for the hitch.

Figure 9 is a side elevation of a fourth embodiment, and

Figure 10 is an enlarged scrap cross-section of the movable securing means thereof.

In the various embodiments analogous parts indicated by the same reference numerals.

Figure 1 shows an excavator 1 having an articulated arm 2. A quick-release hydraulic hitch 3 according to the first embodiment is attached to the free end of the arm 2 for picking up a bucket 4.

As shown in Figure 2, the arm comprises a dipper 5 and a pair of tipping links 6 which are pivotally connected thereto by means of a pair of crown links 7. The relative position of the dipper and tipping links is controlled by means of a hydraulic cylinder 8. The hitch 3 is attached to the free end of the dipper by means of pins 9 and 10.

The bucket 4 is provided with a pair of laterally spaced hangers 11, each of which has two pin holes 12, 13. Any implements for use with the excavator would be provided with an analogous pair of hangers and pin holes. In order to allow the bucket to be used with the hitch of the present invention, a pin 121 is fitted through the pair of holes 12 and another pin 131 is fitted through the pair of holes 13.

In the normal way, these pins would be employed to connect the bucket to th dipper and tipping link.

Th c nstruction of the hitch 3 according to th first embodiment may be appreciated more clearly from Figur s 3 to 5. The hitch comprises a pair of laterally spaced upper flanges 22 interconnected by means of laterally extending bars 24 and 26 welded thereto. A pair of spaced lower flanges 23 are welded to the inner lower sides of the upper flanges 22 and are interconnected by means of a laterally extending bar 25.

Each upper flange 22 is provided with a forward hol 20 and a rear hole 21 for accepting a pin so as to connect the hitch to the excavator arm. Each lower flange is provided at a forward end with a stationary hook in the form of a U-shaped cut out 27. The cut out 27 is intended for hooking the forward bucket pin.

Hydraulically operable sliding hook means 33 comprises a pair of laterally spaced U-shaped hook members 28 attached to each end of a movable bar 29. A hydraulic cylinder 30 is connected at a forward end to bar 24 by means of brackets 31 which embrace the bar and pin 35. At a rearward end, the hydraulic cylinder is connected to bar 29 by means of brackets 32 which embrace the bar and pin 36. Operation f the hydraulic cylinder 30 causes bar 29 to move.

In an alternative form, brackets 32 are disposed in a vertical plane and are pivotally attached to movable bar 29

by means of a transversely extending pin. This arrangement avoids any stresses on the brackets 32 caused by up and down play in movable hook means 33 as a result of wear in the moving parts.

The quick-release hydraulic hitch of the present invention may be operated as follows. First of all, all implements which are to be used are fitted with pins on their hanger arms. Then, the hitch is fitted to the excavator arm by means of pins 9, 10 which connect flanges 22 to dipper 5 and tipping link 6 of the excavator. The hydraulic cylinder 30 is then attached to the hydraulic system of the excavator. The sliding hook means of the hitch is in its retracted position, i.e. when the cylinder 30 is not pressurised. The stationary hook 27 is then hooked around the forward implement pin by manoeuvring the excavator arm. The cylinder 8 of the arm is then operated so as to bring the rearward end of the hitch down between the implement hangers. Then, the hydraulic cylinder 30 is activated so as to force bar 29 and members 28 outwardly and to embrace the rearward implement pin. The hydraulic cylinder 30 is then isolated in its pressurised condition. The implement is thus securely connected to the end of the excavator arm.

Normally, the excavator system pressure is around 3000 pounds per square inch. Relief valves are provided on the hydraulic cylinders to prevent overloading and generally

these work at around 2000 p/si. In a preferred embodiment of the present invention, the hydraulic system connected to the cylinder 30 is provided with an inlet valve set to open at a pressure of around 1200 p/si and the valve is connected to accept excess fluid passing through the relief valves on the other cylinders. Thus, should an obstruction be encountered by the implement, the pressure in one of the cylinders (for example, cylinder 8) rises above 2000 p/si. The excess fluid bled from the cylinder is then fed to cylinder 30 so as to augment the pressure in the cylinder and ensure that the implement is not forceably detached from the excavator arm.

~~Figure 6 shows a second embodiment of the hitch, in~~ which the movable hook means 33 is provided as the lower portion of a pair of pivotable levers 35. The levers are interconnected at an upper end by means of a tube 36 through which pin 10 passes, and at a lower end by rod 37. Hydraulic cylinder 30 is connected to hook means 33 by shaft 34, which is pivotally connected to rod 37. Stationary hook means 27 are provided in a manner analogous to the first embodiment.

Figure 7 shows a third embodiment of the hitch, which is similar to the second embodiment except that the tipping links 6 are replaced by modified links 6^1 provided at a lower end with hook means 33.

~~The stationary hook means 27 is provided on a sleeve~~

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A quick-release hydraulic hitch for attachment to the arm of a hydraulic excavator having a dipper and a tipping link, the hitch being adapted to pick up and retain an implement provided with a pair of parallel laterally extending spaced pins; which hitch comprises

a pair of laterally spaced interconnected upper flanges, each flange having two pin-holes for attaching the hitch to the dipper and tipping links respectively;

a pair of laterally spaced interconnected lower flanges of a spacing less than the spacing of the upper flanges and connected thereto;

the lower flanges being provided at one end with stationary hook means for embracing one pin on the implement; and

hydraulic means connected to sliding hook means at the other end of the lower flanges for embracing the other pin on the implement, so as to attach the implement to the excavator.

2. A hitch according to claim 1 wherein the stationary hook means comprises a pair of U-shaped cut-outs provided in the respective pair of lower flanges.

3. A hitch according to claim 1 wherein the sliding hook means comprises a laterally extending bar having a pair of U-shaped members provided at respective ends thereof.

4. A quick-release hydraulic hitch substantially as disclosed in conjunction with the drawings.

DATED this FIRST day of SEPTEMBER 1986

PAUL OWEN JONES

By his Patent Attorneys

GRIFFITH HASSEL & FRAZER

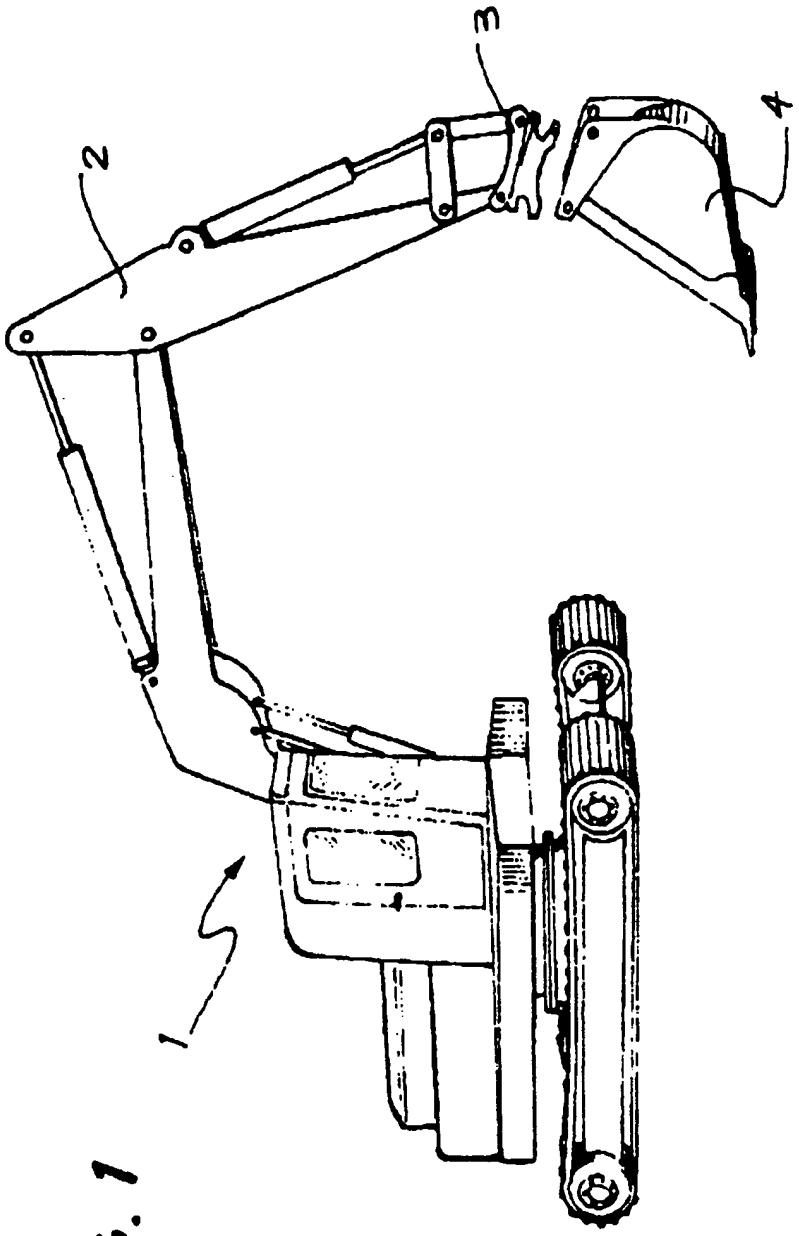
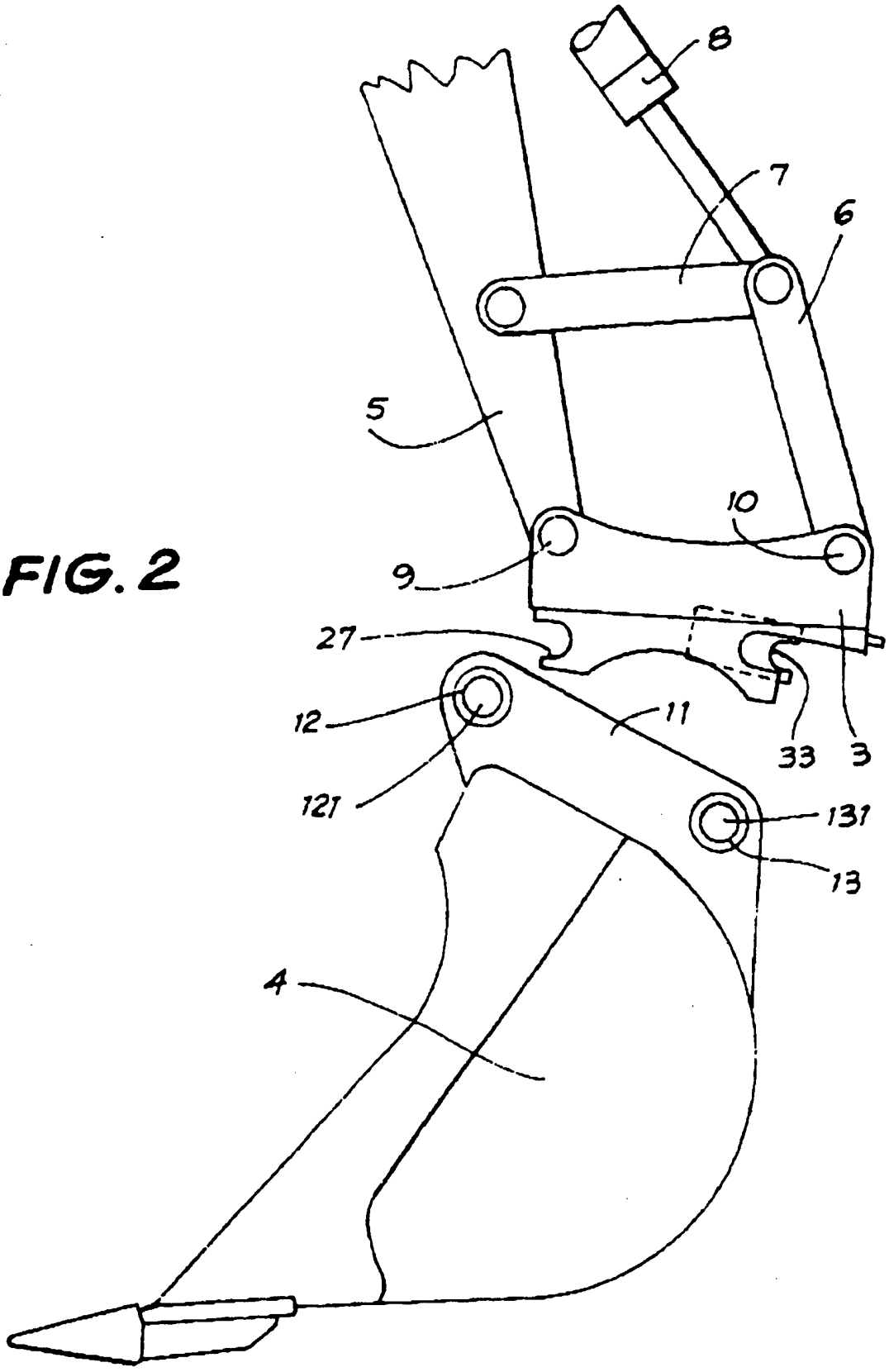


FIG. 1

FIG. 2



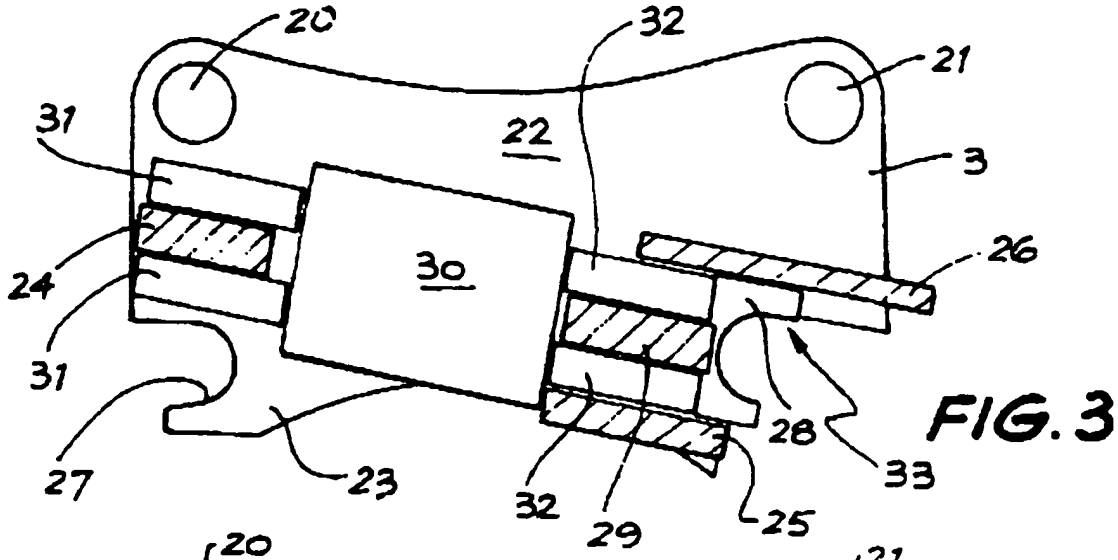


FIG. 3

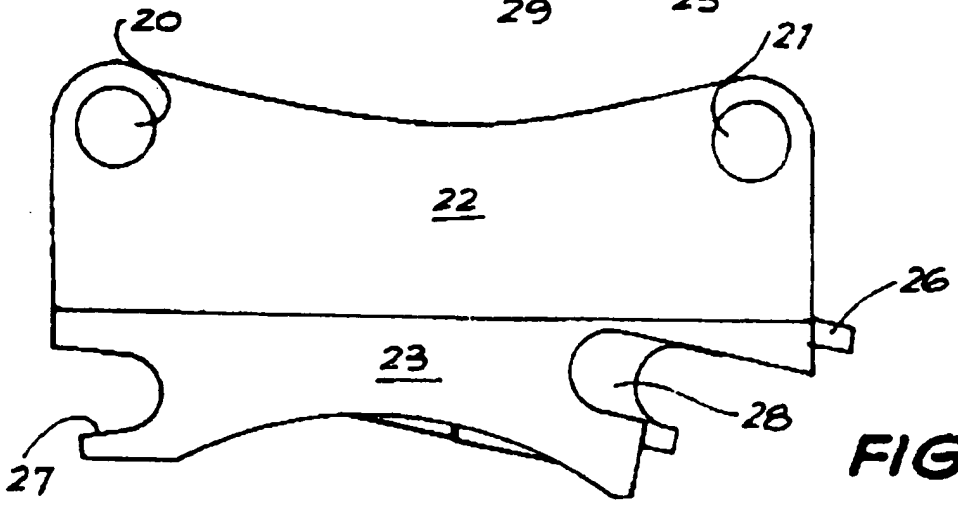


FIG. 4

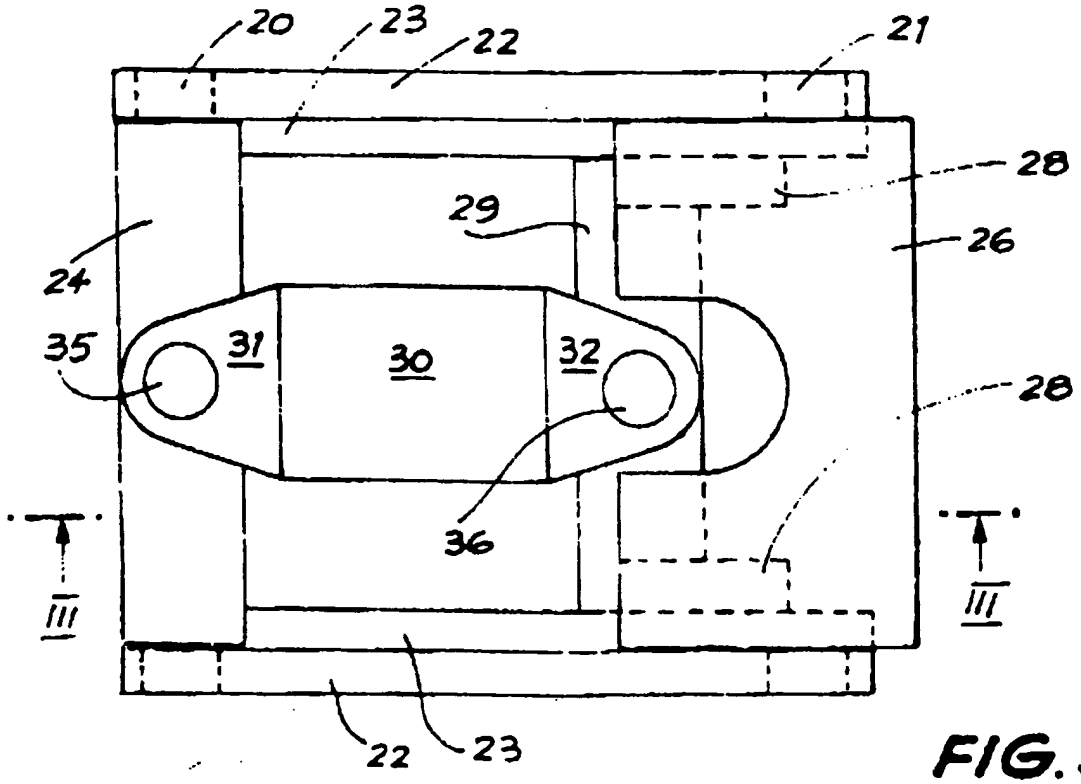


FIG. 5

FIG. 6

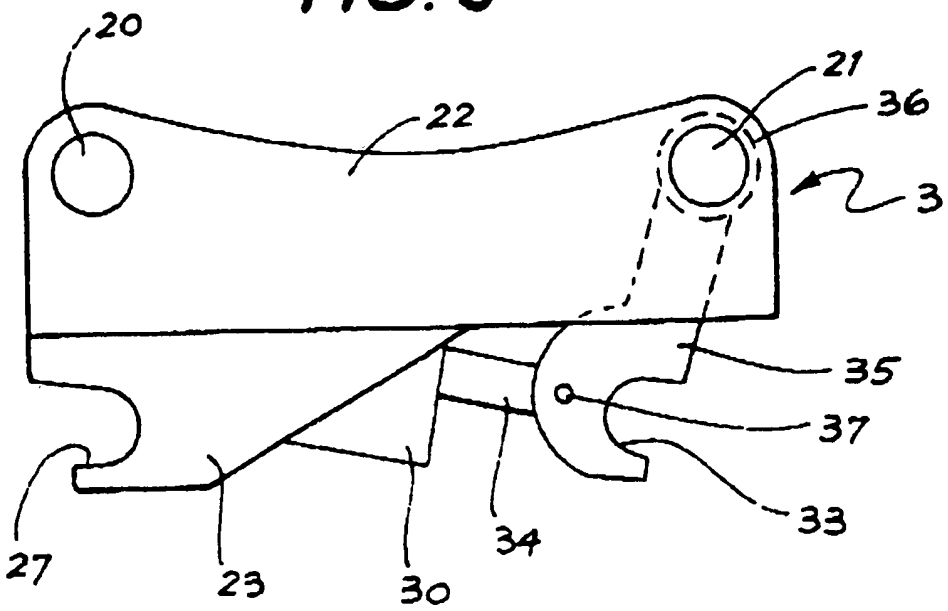


FIG. 7

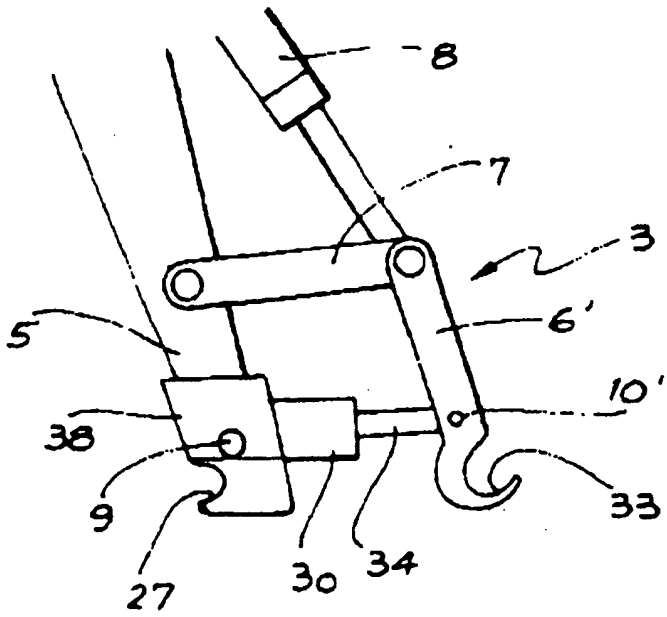


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FIG. 8

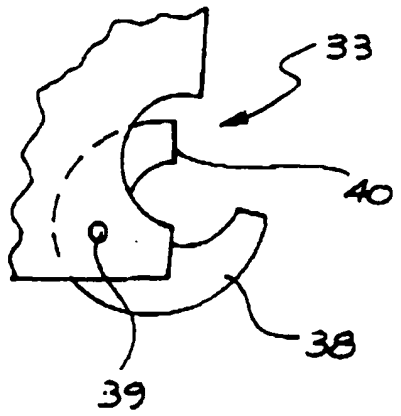


FIG. 9

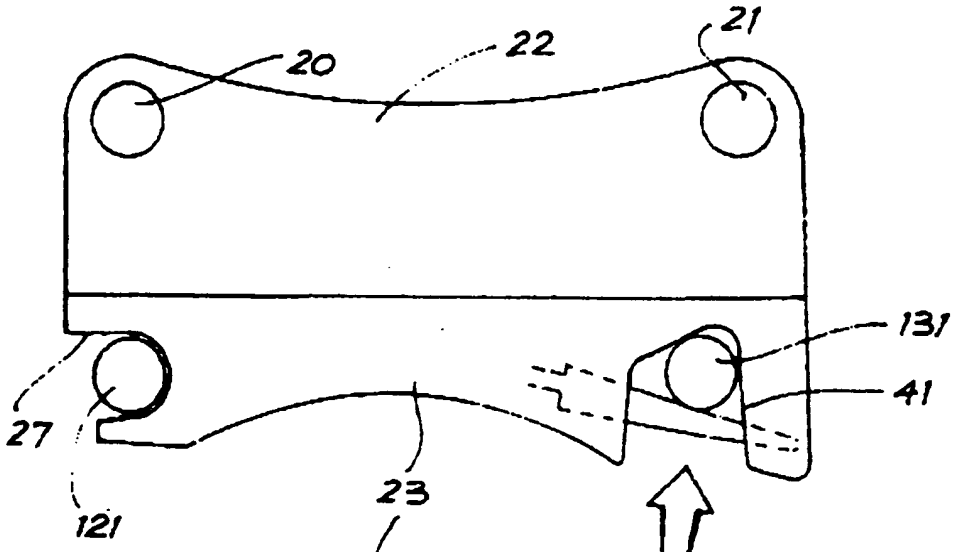
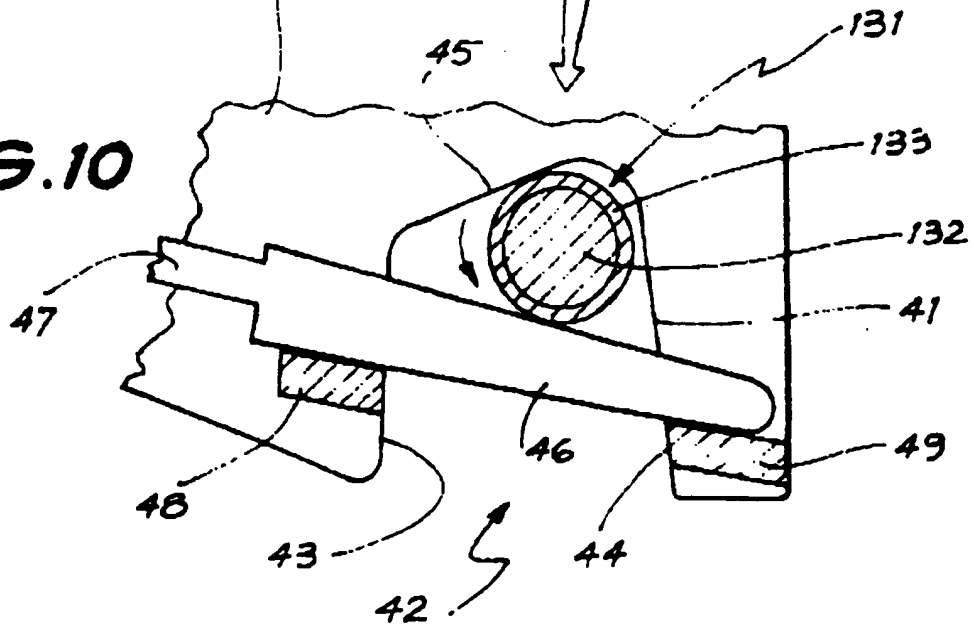


FIG. 10



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